concerned we are indebted to Standfuss[1] for a comprehensive list of the cases recognised, distinguishing between those where the seasonal disparity is so marked as to have led to the bestowal of distinct names on the two forms, and those where the disparity is less and no second name has been given. In the former category there are 23 cases (17 in Butterflies and 6 in Moths), and in the latter 15 (14 in Butterflies and 1 in Moths), making in all 38 cases, viz. 31 in Butterflies and 7 in Moths. The butterflies comprised in the more marked category include 1 case in Satyrinæ, 2 cases in Nymphalinæ, 5 in Lycænidæ, 6 in Pierinæ, and 3 in Papilioninæ; while those in the less marked category are three cases in Satyrinæ, 3 in Nymphalinæ, 3 in Lycænidæ, and 5 in Pierinæ, so that taking the totals of both categories in their order of numerical importance we have 11 cases in Pierinæ, 8 in Lycænidæ, 5 in Nymphalinæ, 4 in Satyrinæ, and 3 in Papilioninæ. The moths are ranked in the more marked category with the exception of a Liparid (*Dasychira abietis*); they are two in the Bombycidæ and four Geometers. The number of known cases in the Palæarctic Region thus appears to be very small, when contrasted with the very large number of species of the groups to which they belong ascertained to inhabit the region; but it may be observed that a considerable proportion of them must be of greatly extended occurrence and very ancient standing, Pryer[2] noting no fewer than six of them in Japan (besides three additional cases in local species); and Dr. A. Fritze[3] further recording in the same country the case of *Araschnia levana* (var. *burejana*).

When we turn to the great tropical and subtropical regions, where butterfly life finds its fullest and most varied development, it is almost disheartening to find how extremely little has been done in the observation of this apparently prominent feature of seasonal variation. With the exception of India in the Oriental Region, and South Africa in the Ethiopian Region, none of the hot or warmer countries have hitherto received the slightest investigation as regards this particular subject of biological inquiry. I can find no record of any observations in East or West Africa, in Australia, or in Central and South America. Feeling especially the deplorable lack of information from that paradise of butterflies, the Neotropical Region, I consulted Dr. F. A. Dixey with the view of ascertaining whether the Pierinæ—the group which he has made so emphatically his own, and which in the Old World has yielded more cases of seasonal dimorphism than any other—offered any instances of the kind in Central or South America. He most obligingly brought together, in the Hope Department of the Oxford University Museum, a series of Neotropical species of *Callidryas*, all of which included forms corresponding in character with the seasonal varieties occurring among their Old-World congeners and allies, viz. a larger form, of deep or rich colouring with the underside freckling and markings strongly expressed; a smaller form, of paler colouring, with the underside freckling and markings very faint or altogether absent; and, in addition to these, specimens holding an intermediate position between them as regards the characters mentioned. Dr. Dixey exhibited this series (with some additions and substitutions) at the Society's meeting on December 7, and explained that, in order to meet the possible objection that the variations in question pointed to *local* forms, he had been careful in the case of each species to select examples from the same locality. The species concerned were *C. rurina* (Mexico), *C. neocypris* (South Paraguay), *C. argante* (Brazil), *C. agarithe* (Mexico), *C. sennae* (Guatemala and Brazil), and *C. philea* (Guatemala). There was no sufficient evidence as to the seasons of appearance of these variations, only seven examples (four *C. argante* and three *C. sennae*) in the whole series bearing dates of capture; but the nature of them, and the parallelism with which they were displayed by each of the six species, were such as to leave little doubt of their being seasonal.

I am further indebted to Dr. Dixey for the first indication of the occurrence of seasonal dimorphism in Australia, afforded by the Old-World section (*Catopsilia*) of the same genus *Callidryas*. In one species, *C. gorgophone*, from Melville Island and Queensland, gradations are found quite in correspondence with those observed in both Indian and Neotropical species; and the same phases are even more completely illustrated in a fine series of Brisbane examples of the well-known Oriental *C. crocale*, which lends some probability to Dr. Dixey's suspicion that *C. crocale* and *C. pomona* (including *C. catilla*) will prove to be seasonal forms of one species.[1]

In bringing to a close this attempt to give a general survey of what has been published on the subject, I purposely abstain from indulging in any speculative disquisition on my own part, because, however attractive to myself such a course might be, I very much doubt if, in the present very restricted bounds of our knowledge, it would prove of any service to the Society. To generalise or to speculate to any good purpose demands a considerable body of well-ascertained fact as a basis, and this—as my remarks have shown—is precisely what is wanting in the present instance, notwithstanding the labours of the entomologists of distinction to whom reference has been made. While fully recognising that the artificial-temperature experiments noted above have been designed and conducted with a skill and thoroughness truly admirable so far as certain species of Palæarctic and Nearctic Lepidoptera are concerned, it cannot at the same time be denied that even in Europe very little has been done to ascertain all the natural conditions under which seasonal dimorphism occurs, or to what extent it is adaptive to the environment; and when we turn to the wide tropical and subtropical regions, it is obvious that we stand upon merely the threshold of inquiry. We have, indeed, from these regions—thanks to such capable observers as De Nicéville and Marshall—some valid experimental evidence to guide us, but this must be very greatly added to, and the life-history of the dimorphic species be worked out from many different directions, before we can hope to approach to a clear comprehension of the complex problem now presented by the extraordinarily impressionable and mutable lepidopterous organism. In studying the cases under notice, it is impossible not to recognise that the most diverse influences are at work—indications of protective and mimetic adaptation, and of sexual selection as well, being combined or contrasted with the effects of varying temperatures and degrees of atmospheric humidity, and with distinct tendencies in the direction of reversion to ancestral characters.

The investigation is one to tax the insight and resource of the ablest and most zealous naturalists, and demands unremitting and most exact observation and record, with carefully controlled breeding from the ova for many successive generations, during a considerable series of years. I am as fully persuaded now as I was on the occasion of my last year's address, that such researches as these can never be satisfactorily prosecuted, and still less brought to any interpretation of permanent scientific value, without the establishment in tropical countries of fitly equipped biological stations for the special observation and study, under as natural conditions as possible, of the surrounding terrestrial fauna. It is unnecessary to dwell upon the manifest advantages attendant on well-directed work pursued steadily and continuously in such a zoological observatory, planted in the very midst of the abounding forms of tropical life, or to do more than mention the exceptionally favourable opportunities for discovery that would thus be afforded. In conclusion, therefore, I will simply express my firm conviction that from a few well-organised stations of this kind, on carefully chosen sites in the four great tropical regions, science would gain more in ten years than from the casual and incomplete observations of ordinary collectors and travellers for the next half-century.

THE PROGRESS OF TECHNICAL EDUCATION.

THE eleventh annual report of the National Association for the Promotion of Technical and Secondary Education is filled with details concerning the systemisation and extension of educational work during last year. A few extracts from the report will show that satisfactory progress was made.

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[1] "Handbuch der Paläarktischen Gross-Schmetterlinge für Forscher und Sammler," ed. 1896, p. 229.

[2] "Rhopalocera Nihonica: a Description of the Butterflies of Japan," 1886–88. The species named are *Papilio machaon*, *P. xuthus*, *Pieris napi*, *Colias hyale*, *Vanessa C.-album*, and *Polyommatus phlaeas*.

[3] *Zool. Anzeiger*, 1890, p. 12. Transl. in *Ann. and Mag. Nat. Hist.* 6), v. p. 200 (1890).

[1] *C. crocale* is an extremely variable and very widely distributed butterfly. Mr. de Nicéville (*Gazetteer of Sikkim*, 1894, p. 166; and *Journ. Asiat. Soc. Bengal*, lxiv. ii. p. 490, 1895) considers that *C. catilla* cannot be held a distinct species from *C. crocale*, all the supposed distinctive characters proving quite inconstant, and breaking down when large numbers of specimens are compared. But he does not think seasonal dimorphism comes into play here, "the innumerable varieties which are found in both sexes occurring at all times."

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England.

It is pleasing to be able to record that, in the year 1897–8, the total amount of money available under the Local Taxation (Customs and Excise) Act, 1890, for technical education and distributed to the local authorities, was again larger than in any precious year, and that a further advance has been made as regards its utilisation for educational purposes.

Of the 49 County Councils in England, 38 are now giving all and 11 are giving part of their grants to educational purposes, while of the 61 County Borough Councils, 56 are devoting all and 5 are devoting part of the fund in a like manner.

In considering the amount of money devoted one way and another, it may be stated that, of the total of 827,000*l.* now available in England alone, no less a sum than 752,000*l.* is being spent upon education. It thus appears that the amount allocated to general county purposes is still as high as 75,000*l.* In this connection it is worthy of note that London's share of the fund now reaches 192,000*l.*, of which the County Council have granted to the Technical Education Board, for 1898–9, a sum of 170,000*l.*, a growth of 20,000*l.* as compared with last year's vote. Again, the Middlesex County Council have recently decided to increase their contribution during the year 1898–9 for the purposes of technical education by 5000*l.* If, after adding these two sums to the 752,000*l.* given above, a deduction is made of the 7000*l.* voted for county purposes by the Staffordshire County Council, there will remain allocated to education for the year 1898–9, the large total of 770,000*l.*

New Technical Schools.

In last year's report it was stated that there were 168 technical schools built, or about to be built, by local authorities in England, and that 142 involved a capital expenditure of 1,718,000*l*, This information may now be supplemented by particulars obtained in response to a special effort made during the year to secure more detailed data: the results of this effort have been published in two separate articles in the last volume of *The Record.* The articles, which are reproduced in the report, deal respectively with the developments in (1) the county boroughs and in (2) the non-county boroughs and urban districts and the administrative county areas, including London, and they show that, excluding London, a capital sum of at least 2,340,651*l.* has been spent upon technical schools in England, and that there are 239 such schools of different types under the control of, or in course of establishment by, local authorities.

Since the publication of the articles it has been decided to erect new technical schools at Barrow, Beverley, Eston and South Bank, Garston, Morecambe, Selly Oak and Walkden; while technical schools have been erected and opened at Lytham and Pokesdown (Bournemouth). The erecting of schools in seven of these towns (excluding Morecambe and Walkden) will involve a total expenditure of 25,200*l.* To this sum should be added (1) an amount of 20,000*l.*, which the Eastbourne Town Council have decided to spend on a combined technical school and free library; (2) a sum of 60,000*l.*, which the Manchester City Council are about to borrow for furnishing and equipping the new municipal technical school; and (3) 18,221*l.* expended on the establishment of the Preston Technical School. It will thus be seen that the aggregate sum incurred in the establishment of technical schools in England up to the present time is 2,464,072*l.*

Wales.

The organisation of technical and intermediate education in Wales continues on the same lines as those indicated in last year's report. The bulk of the available funds is devoted to the purposes of intermediate education, and in several counties (*e.g.* Carmarthen, Carnarvon and Merioneth) the whole grant under the Local Taxation (Customs and Excise) Act, 1890, is similarly utilised. The halfpenny rate under the Intermediate Education Act is levied in all the sixteen counties and county boroughs, and at least ten County and County Borough Councils utilise the provisions of the Technical Instruction Acts. The following is a brief summary of the sums annually appropriated for technical and intermediate education in Wales:—

Residue grant under the Local Taxation (Customs and Excise) Act, 1890	£38,000
Raised by rate under the Technical Instruction Acts, 1889 and 1891	25,000
Raised by rate under the Welsh Intermediate Education Act, 1889, with equivalent grant from Her Majesty's Treasury	£35,000
Total	£98,000

The total sum which has hitherto been absorbed in the erection or adaptation of fifty school buildings in Wales is as much as 182,298*l.*, and in a number of cases half the cost of school buildings has been defrayed by local subscriptions.

It is understood that the University of Wales and the three University Colleges are already profiting by the work done in the county schools. A considerable number of the scholars of the county schools have passed the matriculation examination, either wholly or in part, of the University, and many scholars, with the aid of scholarships won at their several schools, have entered the University Colleges with a view to preparing themselves for a degree. A great deal of technical education is given in evening classes held in connection with some of the county schools, more especially in the mining and the manufacturing districts of Wales.

Scotland.

During the year 1898 the most important matter affecting the organisation of technical and secondary education in Scotland was the passing of an Act whereby a further sum of 35,000*l.* became available on March 31 of this year for the purposes of technical and secondary education.

The Imperial moneys now available for the purposes of higher education in Scotland amount to 181,000*l.*

Ireland.

In matters relating to technical education the past year was an eventful one in Ireland. In 1897 attention was directed to the question of the introduction of manual and practical instruction in the primary schools by reason of the appointment, by the Lord Lieutenant, of a Commission of Inquiry. Speaking broadly, if the recommendations of this Commission are put into force, the Irish system of science, art, manual and practical instruction will become assimilated to the English; and, having regard to instruction now given in elementary schools in Ireland, this will be a great step in advance.

In 1898 the examination of the system of intermediate education was commenced by another Commission, also appointed by the Lord Lieutenant. The Commissioners have already held several sittings and a large amount of evidence has been received, much of which points to the necessity of giving greater encouragement to the study of science, modern languages and commercial subjects, and to the necessity of inspection and *viva voce* examination, in order to ensure that the schools are properly provided with laboratories, that the instruction in science is not mere book learning, and that modern languages are taught as living and not as dead languages.

Under the Local Government (Ireland) Act, 1898, the new County and County Borough Councils are constituted local authorities within the meaning of the Technical Instruction Acts, and the intimation of the Government of their intention to introduce a measure dealing with technical education in Ireland gives promise of further developments.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

Mr. J. Arthur Thomson has been appointed to the chair of Natural History in the University of Aberdeen, vacant by the death of Prof. Alleyne Nicholson.

The *Athenæum* states that the late W. J. Astrakoff has bequeathed to the University of Moscow a sum of a million roubles, on condition that it shall be expended upon a foundation of a "Moscow University for Women," with three faculties —mathematics, medicine, and natural science. He requires that it shall be placed under the direct administration of the Ministry of Public Education, and the programme correspond exactly with that of the university for men.

The ninth annual report on the administration of the Goldsmiths' Company's Technical and Recreative Institute at New Cross shows that something should be done to define the work of institutions of this kind, and prevent neighbouring schools from competing with it. The Institute is one of the finest in London; it is well-equipped, and has a competent staff, yet it has to report that the number of class entries for the year ending

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